

**Patent claims**

1. Method for determining an actual position (A) of a  
5 geodetic instrument (1, 1'),

comprising a positioning system which is based on  
the reception of shadowable signals,

10 and a dead range (T, T') within which the  
propagation of the signal is impaired in such a  
way that a direct determination of the actual  
position (A) by means of the positioning system is  
at least limited,

15 comprising the steps

- recording of a first piece of image information  
from a first known position (P1) determined in  
20 particular by means of the positioning system,  
the first piece of image information having at  
least two identifiable reference structures (5,  
5', 5'') which can be detected at least from a  
partial region of the dead range (T, T'), and  
25 measurement of at least one first distance from  
the first known position (P1), the first  
distance being coordinated indirectly or  
directly with the reference structures (5, 5',  
5''),

30 - recording of a second piece of image  
information from a second known position (P2)  
determined in particular by means of the

25

positioning system, the second piece of image information having at least the two identifiable reference structures (5, 5', 5''), and measurement of at least one second distance from the second known position (P2), the second distance being coordinated indirectly or directly with the reference structures (5, 5', 5'')

5

10 - recording of a piece of actual image information from an actual position (A), the actual image information having at least the two identifiable reference structures (5, 5', 5''), and measurement of at least one actual

15

distance from the actual position (A), the actual distance being coordinated indirectly or directly with the reference structures (5, 5', 5''),

15

20 - derivation of the actual position (A) by referencing relative to the at least two reference structures (5, 5', 5''),

25

it being possible for individual steps or a plurality of the steps to be repeated.

30

2. Method according to Claim 1, characterized in that one distance is measured in each case in the measurement of the distances to each of the reference points (5, 5', 5'').

3. Method according to Claim 1 or 2, characterized in that a measurement of the distance to each point

26

of a detected image is effected in the recording of the image information.

4. Method according to Claim 1, 2 or 3, characterized in that the position of the two reference structures (5, 5', 5'') is determined in the derivation of the actual position (A).
5. Method according to Claim 4, characterized in that the derivation of the actual position (A) is effected by means of a trilinear surveying method.
- 10 6. Method according to Claim 1, 2 or 3, characterized in that, in the derivation of the actual position (A), a transformation is used which links the actual position (A) via the at least two reference structures (5) to the first known position (P1) and the second known position (P2).
- 15 20 7. Method according to any of the preceding Claims, characterized in that the measurement of the distances is carried out by means of optical distance measurement, in particular laser distance measurement.
- 25 8. Method according to any of the preceding Claims, characterized in that the positioning system is the Global Positioning System or another satellite-supported system.
- 30 9. Method according to any of Claims 1 to 8, characterized in that the positioning system is an Earth-supported system, in particular a Total

## Positioning System.

10. Method according to any of the preceding Claims, characterized in that the at least two reference structures (5, 5', 5'') are tracked and/or identified automatically.
15. Method according to any of the preceding Claims, characterized in that at least the first piece of image information is stored and the at least two reference structures (5, 5', 5'') in the second piece of image information and/or the actual image information are identified by image processing methods, in particular by matching methods.
20. Method according to any of the preceding Claims, characterized in that the recording of the first and second pieces of image information and the measurement of the first and second distances are carried out in an automated manner, in particular are constantly repeated.
25. Method according to Claim 12, characterized in that, in the event of a limitation of the direct determination of the actual position (A) by means of the positioning system, the derivation of the actual position (A) is effected in an automated manner, in particular repeatedly or continuously.
30. 14. Device for determining an actual position (A) of a geodetic instrument (1) by a method according to any of Claims 1 to 13, comprising the components

- image recording unit (10), in particular having an image memory and/or an image information memory (13),
- telemeter (12), in particular laser telemeter,
- data processing unit (14) for deriving the actual position,

characterized in that

10

the components are formed and arranged in such a way that a method according to any of Claims 1 to 13 can be carried out in an automated manner.

15 15. Device according to Claim 14, characterized in that the telemeter is integrated in the image recording unit (10), in particular in the form of a range imaging sensor or of a scanning telemeter.

20 16. Device according to Claim 14 or 15, characterized in that the data processing unit (14) is formed in such a way that a limitation of the direct determination of the actual position (A) by means of the positioning system is recognisable and an alarm and/or an automated derivation of the actual position (A) can be triggered.

25

17. Device according to Claim 14, 15 or 16, characterized by an inclinometer (15).

30

18. Device according to any of Claims 14 to 17, characterized by a direction meter (16), in particular a magnetic compass.

19. Geodetic instrument (1) comprising a unit for position determination by means of a positioning system based on the reception of shadowable signals, in particular comprising a unit for position determination which has a reflector for geodetic surveying or a GPS receiver (8), and a device according to any of Claims 14 to 18.

5

10 20. Computer program as a record on a data medium or in the form of a data signal for carrying out the method according to any of Claims 1 to 13.

15

20